ΑΣΤΡΟΝΟΜΙΑ – ΑΣΤΡΟΦΥΣΙΚΗ
ΕΝΔΕΙΚΤΙΚΟ ΤΥΠΟΛΟΓΙΟ

1. $$\mu = \frac{A}{Z+1}, \quad \mu = \frac{1}{2X + \frac{3Y}{4} + \frac{Z}{2}}, \quad \mu_e = \frac{A}{Z}$$

2. $$B_\nu = \frac{2h\nu^3}{c^2}\frac{1}{e^{\frac{h\nu}{kT}} - 1}$$

3. $$\frac{1}{2}m<v^2> = \frac{3}{2}kT, \quad P_G = \frac{\rho}{\mu\, m_H}kT, \quad P_G = \frac{1}{3}\alpha T^4$$

4. $$P_{th} = nkT = \frac{\rho}{\mu m_H}kT = \frac{1}{3}n(m<v^2>) = \frac{2}{3}(n\frac{m<v^2>}{2}), \quad P_{rad} = \frac{1}{2}\alpha T^4$$

5. $$\frac{1}{2}m<v^2> = \frac{3}{2}kT$$

6. $$\text{συν}\alpha = \text{συν}\beta\, \text{συν}\gamma + \text{ημ}\beta\, \text{ημ}\gamma\, \text{συν}A$$

7. $$\frac{\text{ημ}\alpha}{\text{ημ}A} = \frac{\text{ημ}\beta}{\text{ημ}B} = \frac{\text{ημ}\gamma}{\text{ημ}\Gamma}$$

8. $$\text{ημ}\gamma\, \text{συν}A = \text{συν}\alpha\, \text{ημ}\beta - \text{ημ}\alpha\, \text{συν}\beta\, \text{συν}\Gamma$$

8. $$\text{συν}\beta\, \text{συν}\Gamma = \text{ημ}\beta\, \text{σφ}\alpha - \text{ημ}\Gamma\, \text{σφ}A$$

10. $$\alpha_{t2} = \alpha_{t1} + (3.074^s + 1.336^s \sin\alpha_{t1} \times \tan\delta_{t1}) \times Y$$

11. $$\delta_{t2} = \delta_{t1} + 20.''04 \cos\alpha_{t1} \times Y$$

12. $$ST_G = ST_o + \frac{366.2422}{365.2422} \times UT$$

13. $$m_2 - m_1 = 2.5\log(\frac{\ell_1}{\ell_2}), \quad M - m + A = 5 - 5\log r$$

14. $$\ell = \frac{L}{4\pi r^2}, \quad L = 4\pi R^2 F = 4\pi R^2 \int_0^\infty F_\lambda d\lambda = 4\pi R^2 \sigma T_{eff}^4$$

15. $$E_{B\text{-}V} = (B–V) – (B–V)_o, \quad A_V = 3\,E_{B–V}, \quad A_B = 4E_{B–V}$$

16. $$E = -\frac{1}{n^2}\frac{2\pi^2 m_e e^4}{h^2}$$

17. $$\frac{1}{\lambda} = R\left|\frac{1}{n_2^2} - \frac{1}{n_1^2}\right|$$

18. $$\Sigma\sigma_\nu = \frac{dI_\nu}{I_\nu dr} = \kappa_\nu\rho\,, \qquad \ell = \frac{1}{\kappa\,\rho}$$

19. $$dI_\nu = -I_\nu(r)\,\kappa_\nu\rho\,dr + j_\nu\rho\,dr$$

20. $$\tau_\nu = \int_0^r \kappa_\nu\rho\,dr, \qquad S_\nu = \frac{j_\nu}{\kappa_\nu}, \qquad I_\nu(\tau_\nu) = I_\nu(0)\,e^{-\tau_\nu} + S_\nu(1-e^{-\tau_\nu})$$

21. $$A^3/P^2 = G(M_\odot + M_\oplus)/4\pi^2$$

22. $$\frac{dM(r)}{dr} = 4\pi\,\rho(r)\,r^2$$

23. $$\frac{dP}{dr} = -\frac{G\,M(r)\,\rho(r)}{r^2}$$

24. $$\mathcal{E} = \frac{1}{2}\int_0^R \frac{G\,M(r)\,dM}{r} = -\frac{1}{2}W\,, \quad 2\mathcal{E} + W = 0$$

25. $$P_C = \frac{3G}{8\pi}\frac{M^2}{R^4}\,, \quad T_C = \frac{G}{2k}\frac{M\,\mu m_P}{R}$$

26. $$\kappa_\alpha = 4.34\text{x}10^{25}\,Z\,(1+X)\,(g_\alpha/t)\,\rho\,T^{-3.5}\,, \quad \kappa_\beta = 3.68\text{x}10^{22}\,(1+X)\,(1-Z)\,g_\beta\,\rho\,T^{-3.5}$$

27. $$\kappa_\gamma = 0.2\,(1+X)$$

28. $$\frac{dT}{dr} = -\frac{3\kappa(r)\rho(r)L(r)}{16\pi\,\alpha\,c\,r^2T^3}$$

29. $$L_\odot = \frac{16\pi\,\alpha\,c\left(\frac{R_\odot}{2}\right)^2\left(\frac{T_C}{2}\right)^3\left(\frac{T_C}{R_\odot}\right)}{3\kappa\,\alpha\,\rho}$$

30. $$N = \frac{R_\odot^2}{\ell^2}$$

31. $$\frac{dT}{dr} = -\frac{\gamma-1}{\gamma}\frac{G\mu\,m_P}{k}\frac{M(r)}{r^2}$$

32. $$\frac{dL}{dr} = 4\,\pi\,r^2\rho(r)\,\varepsilon(r), \qquad \varepsilon = 0.1\,X^2\rho(10^7\,\mathrm{T})^4\left[\frac{erg}{gr\,s}\right]$$

33. $$L \sim R^{-0.5}M^{5.5}\mu^{7.5}$$

34. $$L \sim M^{3.5}$$

35. $$\omega_{\min} = 1.22\left(\frac{\lambda}{D}\right)$$

36. $$\log \omega^2 < 2.8 - 0.2 m_v$$

37. $$M_1/M_2 = A_2/A_1, \quad v_\alpha/c = \Delta\lambda/\lambda, \quad v_{jmax} = \omega A_j \sin(i)$$

38. $$f(M_1, M_2, i) = \left(\frac{M_2}{M_1 + M_2}\right)^2 M_2 \sin^3(i) = \frac{(A_1 \sin(i))^3}{P^2}$$

39. $$r_2 = A\left(0.5 + 0.2 \log(\frac{M_2}{M_1})\right), \quad (\mu \geq 0.1)$$

40. $$r_2 = A\left(\frac{\mu}{3}\right)^{\frac{1}{3}}\left(1 - \frac{1}{3}\left(\frac{\mu}{3}\right)^{\frac{1}{3}} - \frac{1}{9}\left(\frac{\mu}{3}\right)^{\frac{2}{3}} + \ldots\right) \quad (\mu < 0.1)$$

41. $$P_e = 0.0485\left(\frac{h^2}{m_e}\right)\left(\frac{\rho}{\mu_e m_P}\right)^{\frac{5}{3}}, \quad P_e = 0.123\, h\, c\, n_e^{\frac{4}{3}}$$

42. $$R = 5.1 \frac{h^2}{G\, m_e m_P^{\frac{5}{3}}}\left(\frac{Z}{A}\right)^{-\frac{5}{3}} M^{-\frac{1}{3}}$$

43. $$M_{Ch} = 0.20\left(\frac{Z}{A}\right)^2 \left(\frac{h\,c}{G\, m_P^2}\right)^{\frac{3}{2}} m_P$$

44. $$R \approx \frac{h^2}{G\, m_P^{\frac{8}{3}}} M^{-\frac{1}{3}}$$

45. $$R_S = 2G\frac{M}{c^2}$$

46. $$\frac{\lambda}{\lambda_o} = \left(1 - \frac{2GM}{r_o c^2}\right)^{-\frac{1}{2}}$$

47. $$E^2 = \left(M c^2 + \frac{Q^2 c^4}{4GM}\right)^2 + \left(\frac{J c^3}{2GM}\right)^2, \qquad S = S_o + \left(\frac{\pi k c^3}{2Gh}\right) A$$

48. $$T = \frac{h c^3}{16\pi^2 k G}\frac{1}{M} = 6\times10^{-8}\frac{M_\odot}{M}$$

49.

50. $$L_{Edd} = \frac{4\pi G M c}{0.2(1+X)} = \frac{2.52\times10^{38}}{1+X}\frac{M}{M_\odot} \; [erg\, s^{-1}]$$

51. $$\frac{L}{L_\odot} = 10^{0.479}\left(\frac{M}{M_\odot}\right)^{2.91} = 3.013\left(\frac{M}{M_\odot}\right)^{2.91}$$

52. $$M_{\max} = \left(\frac{2.13\times 10^4}{1+X}\right)^{0.524} M_\odot$$

53. $$L_J = \left(\frac{kT}{m_P G\,\rho\,\mu}\right)^{\frac{1}{2}} = 3.5\times 10^{-11}\left(\frac{\mathrm{T}}{\mu\,\rho\left[gr\,cm^3\right]}\right)^{\frac{1}{2}} \quad [pc]$$

54. $$M_J = \frac{4\pi}{3}\rho L_J^3 = \frac{4\pi}{3}\rho\left(\frac{kT}{m_P G\,r\,\mu}\right)^{\frac{3}{2}} = 9\times 10^{-11}\left(\frac{\mathrm{T}}{\mu}\right)^{\frac{3}{2}}\rho^{-\frac{1}{2}} \quad \mathrm{M}_\odot$$

55. $$\log P = \alpha\, m_{pg} + \beta$$

56. $$P = \frac{2\pi}{\omega} = \sqrt{\frac{\pi}{\left(\gamma - 4/3\right)G}} < \rho >^{-1/2}$$

57. $$P = Q <\rho/\rho_{¤}>^{-1/2} \sim P = 0.07 <\rho/\rho_{¤}>^{-1/2}$$

58. $$\log(P\ [\mathrm{d}]) = -0.232 M_{bol} - 2.85 \log T_{eff} + 9.294 \quad (\mathrm{T}_{eff} > 20\,000\ \mathrm{K})$$

59. $$\log(P/\ [\mathrm{d}]) = -0.275 M_{bol} - 3.91 \log T_{eff} + 14.543 \quad (\mathrm{T}_{eff} < 12\,600\ \mathrm{K})$$